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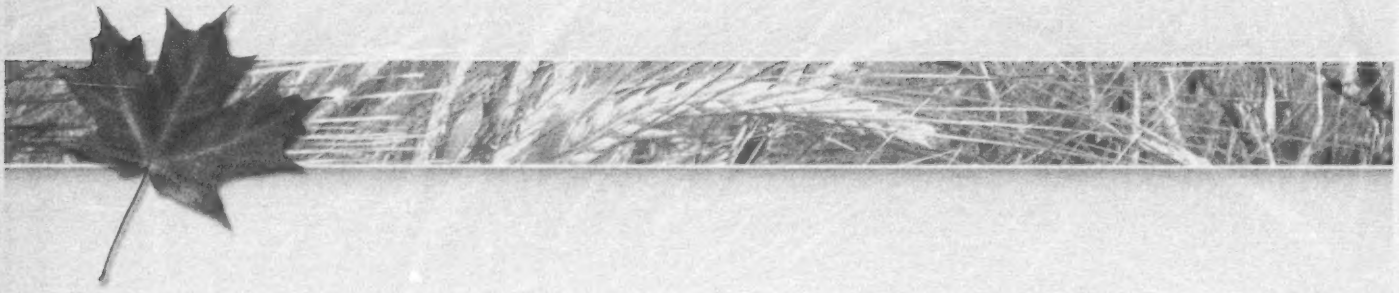

2014 Annual Review of Agroclimate Conditions Across Canada

This report is produced by Agriculture and Agri-Food Canada's National Agroclimate Information Service and summarizes the agroclimate conditions and impacts experienced across Canada during the 2014 agricultural year.

Canada

Annual Review of Agroclimate Conditions Across Canada, 2014

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Overview

This report was compiled and written over the period May 2014 to December 2014 to summarize the variable weather conditions and resultant agroclimate impacts across Canada during the 2014 growing season. It also provides a seasonal forecast from January to March.

The 2014 growing season was again a challenging one for many producers in Canada. Cool spring temperatures, excess moisture, flooding, drought, hail storms, summer snow and early frost were the most significant impacts to agricultural production. Overall, the agroclimate conditions across the country this year decreased production levels 15 to 30 per cent from last year's record yields and crop quality was below-average to much below-average.

Specifically by region, the Pacific Region (British Columbia) experienced hot and abnormally dry conditions. A large extent and number of wildfires and record low stream flows resulted in only minor impacts to agriculture but drought in the north and central interior significantly reduced forage production and reduced some crop yields.

In the Prairie region (Alberta, Saskatchewan, Manitoba), a wet and cold spring delayed seeding and crop development. Approximately 8 million acres in Saskatchewan and Manitoba either went unseeded due to excess moisture or were impacted by flooding. Large and frequent precipitation events, disease, drought in northern Alberta and an early snow in southern Alberta further reduced crop quality across the Prairie region. Due to the extent, frequency and intensity of storm events, average insurance claims in 2014 were up 42 per cent from last year. Ultimately, hail, frost and wind cost Alberta producers approximately $500 million in 2014[1]. Warm temperatures through August however, advanced crop development and warm weather in late September and early October helped save the season. Overall, near-average yields were recorded.

The Central region (Ontario and Quebec) experienced a cool spring with above-normal precipitation that delayed seeding. Thunderstorms in the summer, continued excess moisture, early frost in the fall and heavy snowfall in November, significantly delayed harvest into December. Overall yields were near-average but of average to below-average quality.

The Atlantic region (Nova Scotia, New Brunswick, Prince Edward Island and Newfoundland) also had a cold and wet spring followed by post-tropical storm Arthur in June. The immediate impact of the high winds and rain were minimal, but disease spread by wind resulted in moderate yield reductions later in the season. Dry conditions and an early frost damaged some crops, reduced forage and delayed harvest well into December. Overall yields and the quality of most crops were near to above-average.

Livestock producers faced significant feed shortages through the year due to drought in northern British Columbia and Alberta and flooding in Saskatchewan and Manitoba. In December, AAFC announced tax deferral provisions to assist producers in these areas who had to reduce herd sizes due to lack of available feed supplies. An Agri-Recovery program was also implemented in Manitoba to assist producers in covering the cost of purchasing and transporting feed where forage and hay land was flooded.

The Environment Canada forecast for January through March calls for average temperatures in the majority of Canada's agricultural land. Above-normal temperatures are expected in the Pacific and Atlantic regions, with the strongest probability of above-normal temperatures along coastal British Columbia and Nova Scotia. Northern Manitoba, Ontario and Quebec are expected to experience below -normal temperatures. Above-normal precipitation is expected in Alberta, Saskatchewan and Nova Scotia. If the forecast proves accurate, over-wintering crops will benefit from the mild conditions and there will be less pressure on prolonging feed supplies for livestock producers.

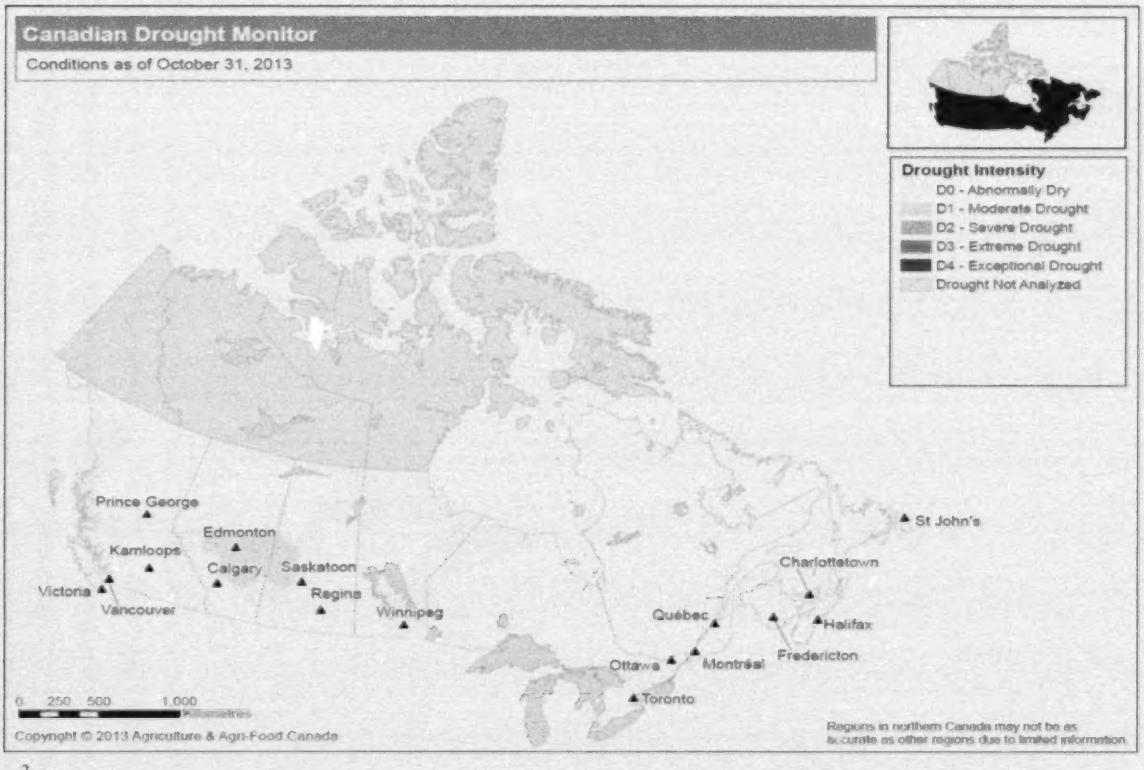
[1] Environment Canada. 2014. "Canada's Top Ten Weather Stories for 2014." Available Online at http://www.ec.gc.ca/meteo-weather/default.asp?lang=En&n=C8D88613-1

Conditions leading into the 2014 Growing Season

The 2013 spring and summer seasons were wet but the fall season was relatively dry. While significant rainfall fell in the interior of British Columbia, southern Ontario and Atlantic Canada, large regions of the northern and central Prairie region received below or well-below normal precipitation. As of the end of October, more than 25 per cent of Canada's agricultural regions received low to record-low precipitation. This dryness was especially welcome in areas coping with excess moisture from the spring and summer such as Alberta and Saskatchewan. By the end of October a large portion of east-central Alberta and west-central Saskatchewan was in moderate drought (Figure 1). These conditions were ideal for crop maturity of late seeded crops and harvest operations. Resulting yields were above-average to record-high in the Prairie region, average to above-average in the Pacific region, and average in the Central and Atlantic regions.

The dry fall of 2013 was followed by the coldest winter in 18 years—the third coldest on record. November was mild, but this drastically changed as the calendar year ended. At the end of December, nearly all of Canada east of the Rocky Mountains was experiencing temperatures more than -3 degrees Celsius below normal, with large portions of the Prairie region reporting more than 5 degrees Celsius below normal (Figure 2). Conditions moderated somewhat in January but the cold returned and continued throughout the entire winter. At the end of February, Environment Canada reported that a majority of the Prairie region experienced nearly twice the number of cool days for the winter (greater than -25 degrees Celsius) compared to normal. For the Prairie region and north-west Ontario, the lengthy duration of well-below normal conditions resulted in concern for winterkill in crops and forages, underweight cattle and increased risk for livestock mortality. The record-cold temperatures also had negative implications for grain storage and transportation and significantly less grain was transported across Canada throughout the 2013-2014 winter[2].

Figure 1: Canadian Drought Conditions at the end of October, 2013



[2] Cross, Brian. 2014. "Eastern flour mills scramble to find wheat" The Western Producer: News. Available at http://www.producer.com/daily/eastern-flour-mills-scramble-to-find-wheat/

Figure 2: Mean Temperature Difference from Normal, December 1, 2013 to March 31, 2014

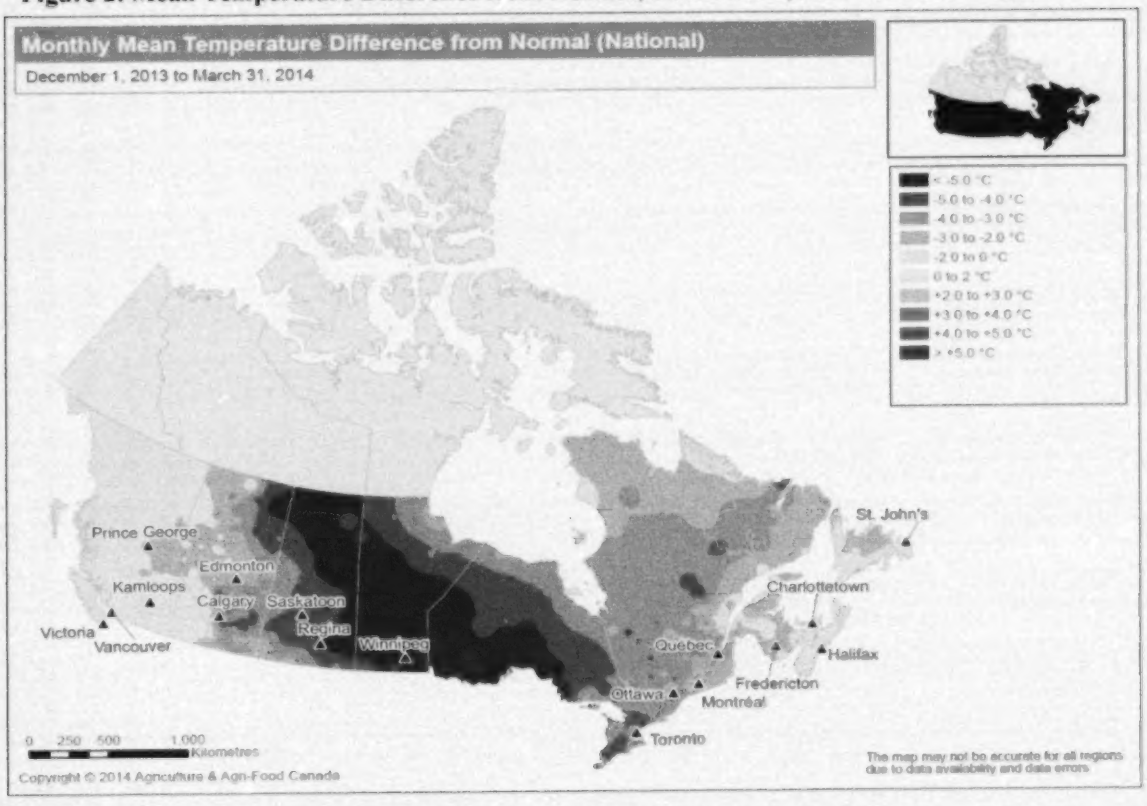
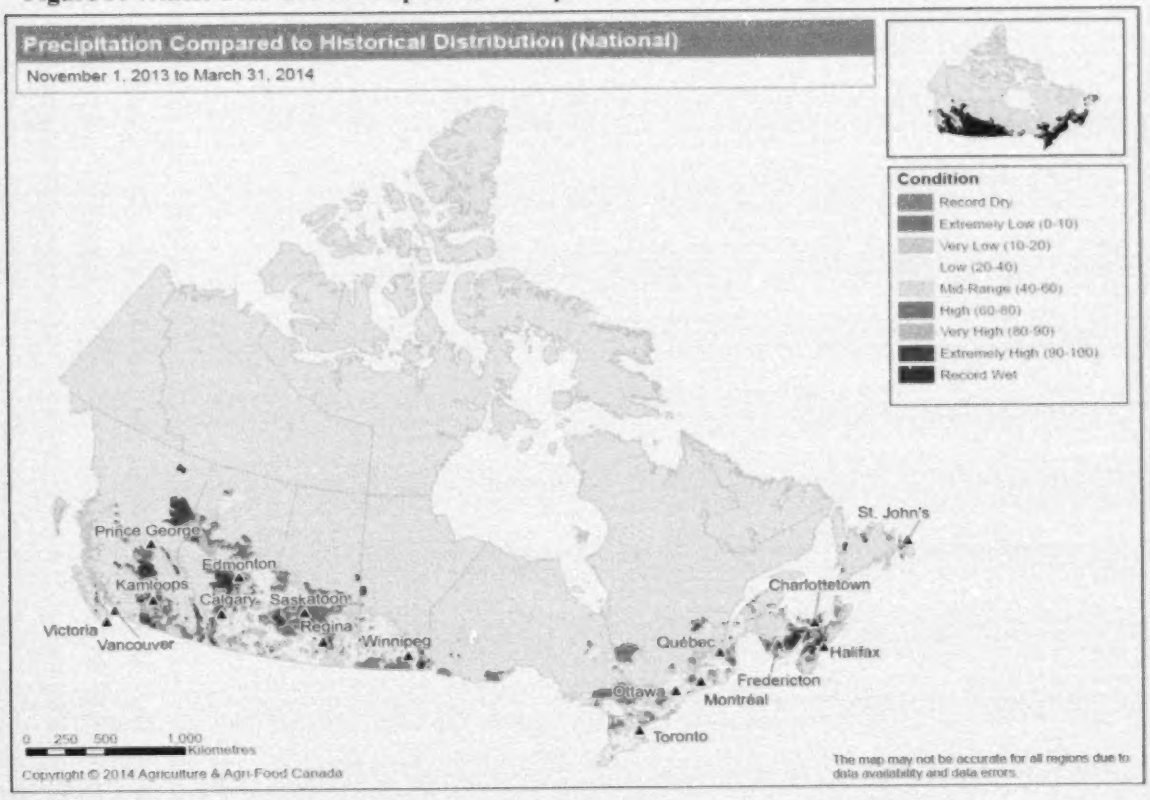


Figure 3: Winter 2013-2014 Precipitation Compared to Historical Distribution



Precipitation was a less dramatic story than the record low temperatures. The winter began with average to above-average precipitation in western Canada and normal to slightly-below-normal in eastern Canada. Precipitation through the winter fell to below-normal during the winter months for much of Canada's agricultural region (Figure 3). The Pacific region received variable precipitation, with high levels in the central-interior and minimal amounts in the south and on Vancouver Island. Dry conditions existed in east-central and south-east Alberta, southern Manitoba and the St. Lawrence basin in Quebec. Conversely, the north and central portions of the Prairie region had abundant snowfall with water content of up to 100 mm, particularly the areas north of Saskatoon and Calgary, stretching into the Peace River district of British Columbia. Snowfall records were set in Kenora, Calgary, Red Deer and Windsor. In the central Prairie region, snow was on the ground for six months - the longest continuous snow cover since 1955. In eastern Canada, the region between southern Ontario and Quebec received low to average precipitation while the Atlantic Region experienced above-normal levels in early winter. These regions also experienced two large storms which resulted in thick extents of ice. Fortunately, this did not lead to extensive flooding in the spring.

Below-normal precipitation and temperatures prevailed through February and March, and increased the risks to agriculture from frozen soils, snow mold and isolated flooding. By the end of March moisture was needed to recharge the Prairie and Central regions. In the Atlantic region however, the cold temperatures were expected to kill the viruses which affected fruit producers in the 2013 growing season. Below-normal and record-cold temperatures continued across most of the country, and many producers became concerned with delays to spring seeding.

Spring 2014 (April - June)

Following the record-cold winter, spring was particularly challenging in the Prairie, Central and Atlantic regions, where below-normal temperatures and frequent precipitation delayed seeding and crop development. A trend of heavy precipitation and excessive moisture began in April that would remain until June, eventually culminating in a flood event in the Prairie region. The agricultural impacts from these conditions included significant delays to farm operations and feed shortages.

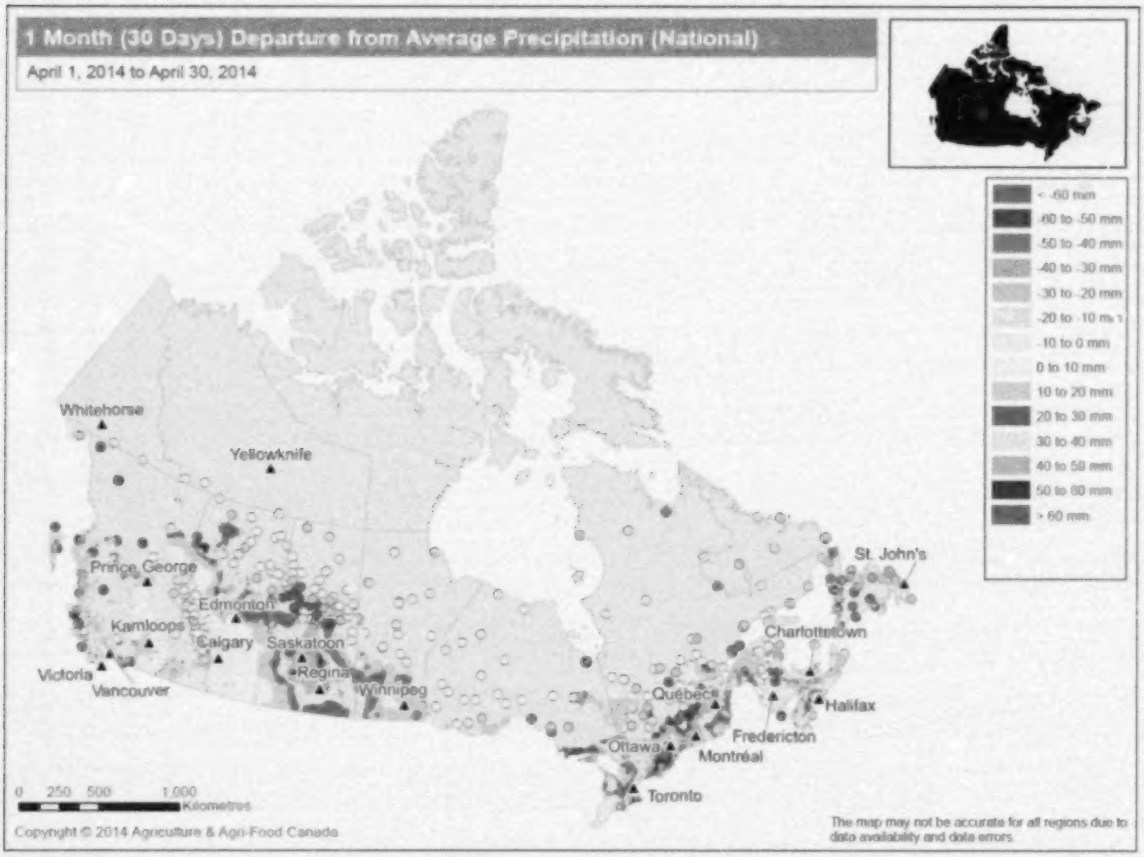
Below-normal temperatures accompanied the rain that began in April. Although a brief front warmed the Pacific region, southern Alberta and Ontario in the second week of April, temperatures again plunged below normal for the rest of the month ranging from 5 degrees Celsius below normal in southern regions from Alberta to Quebec to 2 degrees Celsius below normal in the Atlantic region, northern British Columbia and northern Alberta. Precipitation events of more than 40 mm were common across most of the country and Saskatchewan in particular received more than 200 per cent of average precipitation. By the end of April only Newfoundland, southern Ontario and west-central Alberta had received below average precipitation (Figure 4).

Despite the generally wet conditions, the flood risk was low across Canada in April, and only localized flooding impacted agricultural operations. Eastern Canada for example received between 30 to 80 mm of rain in the first two weeks of April, causing minor flooding and damage to peach and grape crops in southern Ontario. Flooding in Manitoba and New Brunswick in mid-April caused delayed seeding in both provinces and the closure of 78 roads in New Brunswick. By the end of April soil moisture was low in the western Prairie region and wet in the Central and Atlantic regions, with the exception of the southern tip of Ontario. Soil moisture in Alberta, with extremely high levels in the west and very low levels in the east-central, was of particular concern.

Agricultural impacts reported at this time were moderate and included winter damage to crops and operational delays. Reports of winterkill in April were generally low across the country except for Alberta and the Central region, where up to 20 per cent of acres were reported as sustaining damage. Operational delays were common in all provinces during the spring as excess moisture and

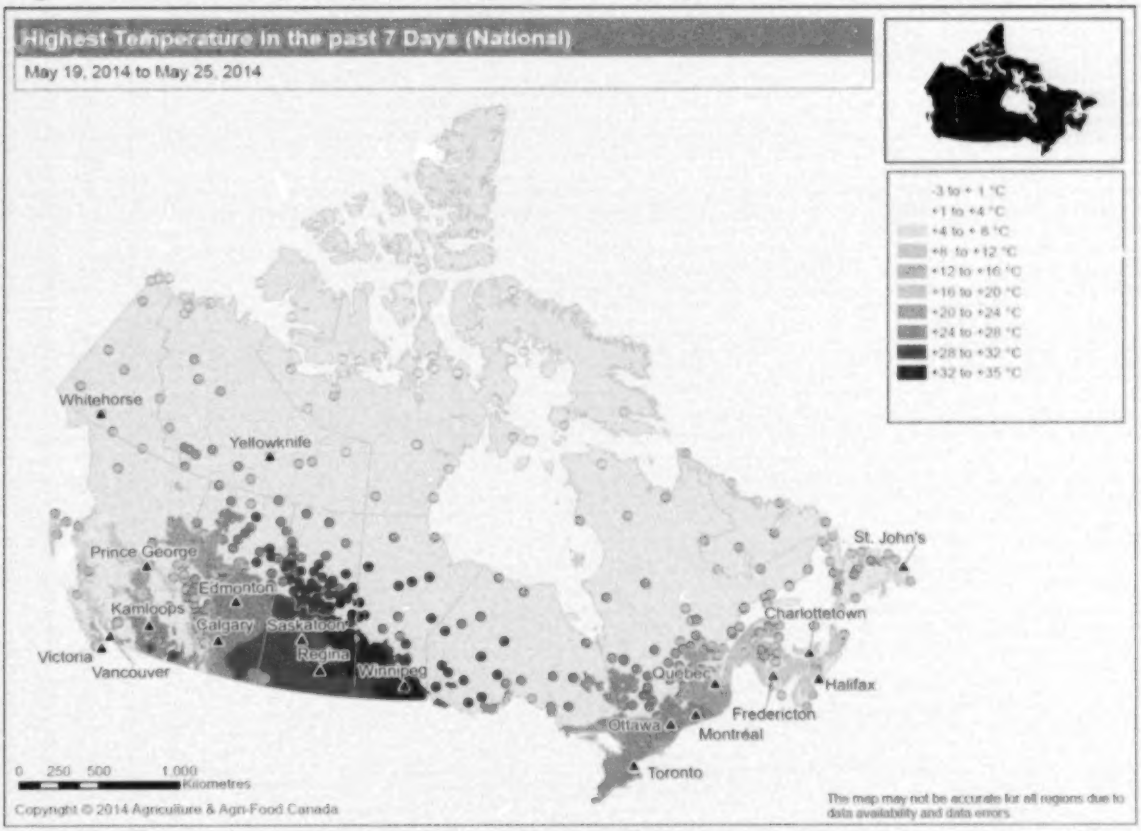
low temperatures delayed seeding across the country through April until early June. Delays to seeding and crop development in early spring ranged from days to 2 weeks, but reached up to 3 weeks in the Atlantic Region for maple syrup, berries and potatoes. In some areas, seeding deadlines were extended and producers were forced to stretch bedding and feed supplies as the conditions prevented putting livestock out to pasture.

Figure 4: Difference from Normal Precipitation, April 1 to April 30, 2014



Although largely still wet and cool across the country, conditions in May generally improved. At the start of the month, temperatures were 2 to 3 degrees Celsius above normal for the Pacific region, while the remainder of the country lingered below normal. Alberta and Saskatchewan in particular were very cool, experiencing temperatures 3 to 5 degrees Celsius below normal. Other than a torrential rain event in the Pacific region (May 5, which caused some losses of early season vegetables in South Surrey) the flood risks declined in most regions as the spring advanced. Seeding operations and crop development remained 1 to 2 weeks behind across Canada until a surge in temperatures near the end of May, which resulted in a high level of seeding activity and seeded acres in some areas increased by up to 40 per cent within one week. Temperatures of more than 20 degrees Celsius were experienced across the country, but particularly in the Prairie and Central regions, in the last week of May (Figure 5). Records were set in the Prairie region where temperatures reached highs of up to 35 degrees Celsius. In the Atlantic region however, temperatures remained slightly below normal which resulted in delays releasing cattle to pasture and some replanting of frost-sensitive crops such as peppers and tomatoes.

Figure 5: National 7 Day Temperature High, May 19 to May 25, 2014



Despite generally good conditions in May, a return to cool temperatures, extra precipitation and flooding in June further degraded crop development across the western portion of the country. Conditions stabilized in the Central and Atlantic regions while the Prairie region continued to experience cool temperatures and precipitation, becoming increasingly wet over June. Frost, with temperatures –3 to –5 degrees Celsius below normal during the first week of June, further delayed seeding (Figure 6). Alberta received extra precipitation in regions already experiencing excess moisture. Areas with low soil moisture in the Peace River district received less than 5 mm of rain while the wet west-central and north received 25 to 50 mm. Southern Saskatchewan also received significant precipitation in early and mid-June, with many areas reporting more than 75 mm (Figure 7). Despite cool temperatures and wet conditions, the majority of crops were planted by mid-June.

In the month of June there were two large storm events in the Prairie region, the latter larger than the former. On June 16th and 17th, heavy rains (upwards of 100 mm) fell in cropland around Lethbridge and west into the foothills of Alberta, an area which had already received more than 150 mm in the past two weeks. Saskatchewan and Manitoba received rain from the same storm system. Ten days later, between June 28th and 30th, a major storm system impacted the western Prairie region with precipitation of 40 mm to 200 mm in a wide band from east of Saskatoon through Melville to Brandon and Melita (Figure 8). The storm system stalled over the Saskatchewan-Manitoba border and resulted in almost a year's worth of rain over the course of 3 days in some places. More than 1500 people were evacuated and 100 local states of emergency were declared in Saskatchewan and Manitoba, with Manitoba declaring a provincial state of emergency July 4th. Flows on major waterways such as the Assiniboine River were above the record levels set only 2 years previously during the high profile floods of 2011. The immediate impact of this major rainfall event was extensive flooding, infrastructure damage, road closures, sewage and water system malfunction and lack of access to fields. Crops in the affected regions were in standing water or saturated soil and producers were having trouble accessing fields and reaching livestock stranded in pastures.

Figure 6: Below-Average Temperatures in the Prairie Region, June 2 to June 8, 2014

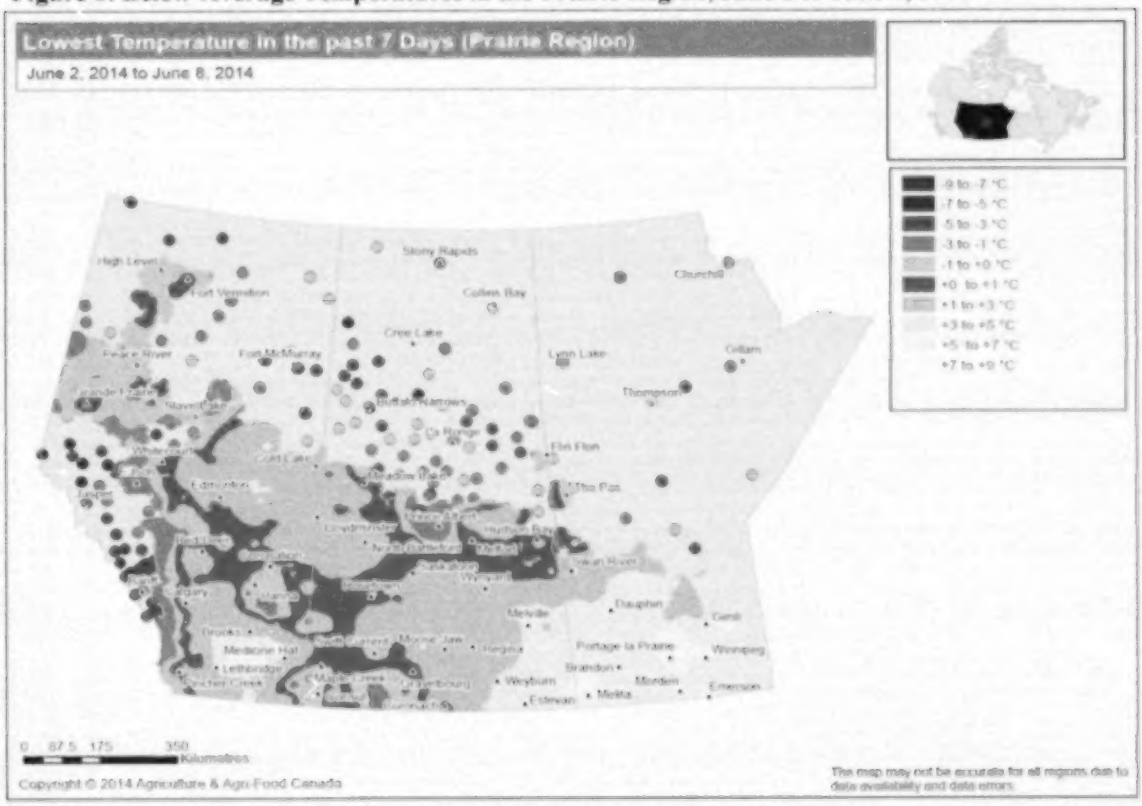


Figure 7: June Precipitation Prior to Flooding in the Prairie Region, May 28 to June 10, 2014

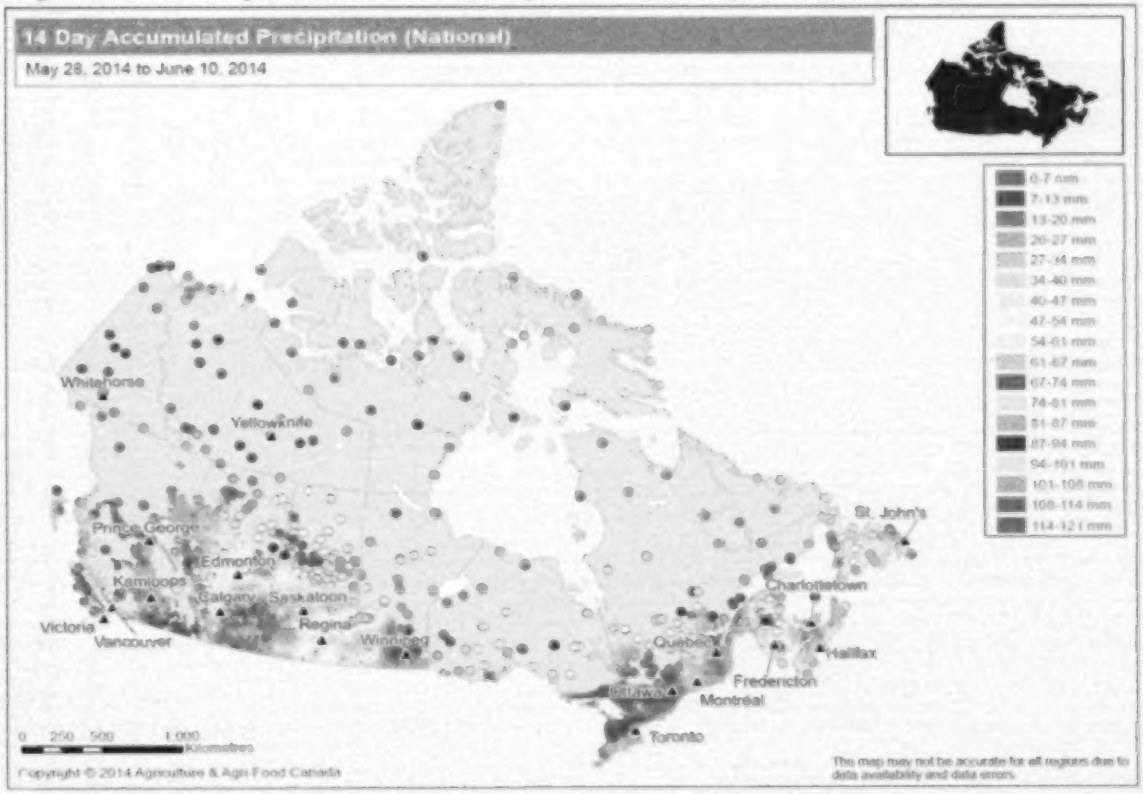
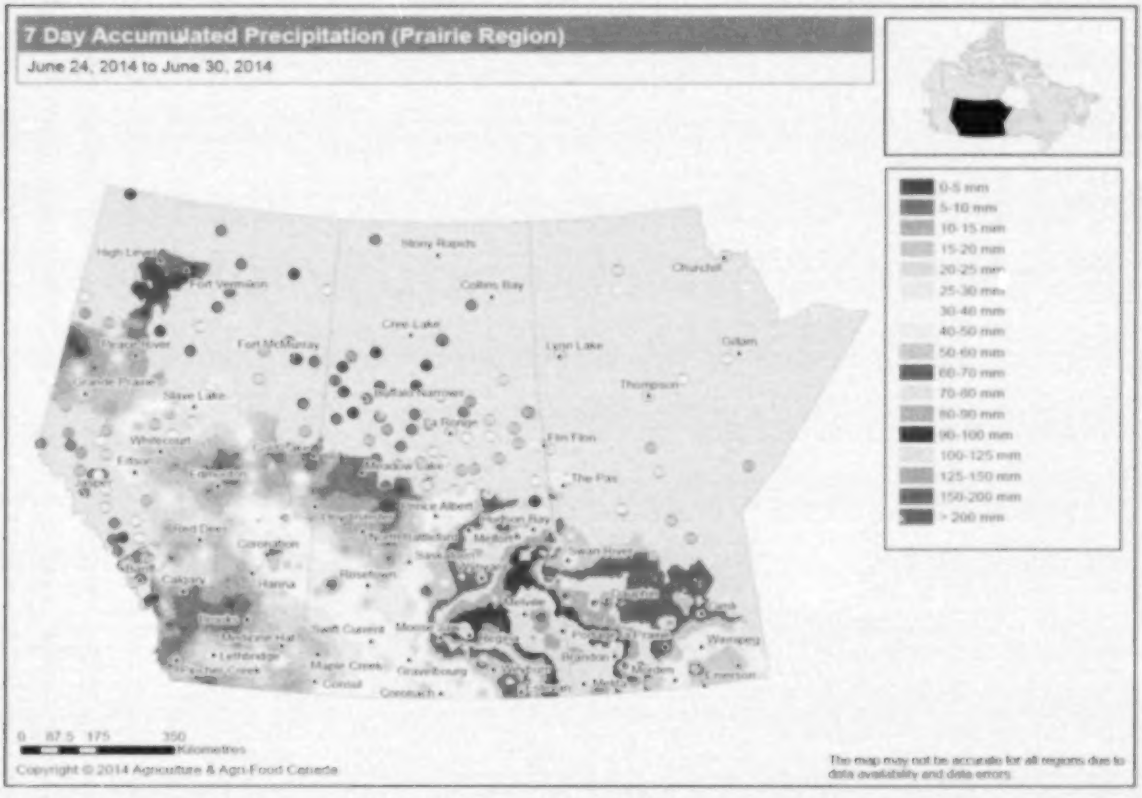


Figure 8: June Precipitation Leading to Flooding in the Prairie Region, June 24 to June 30, 2014



Overall, June was a very wet month especially in the Prairie region. A number of records were broken: Lethbridge recorded its wettest month ever with 280 mm of rain; total April to June rainfall in Regina was 216 per cent of normal; and Brandon experienced its wettest month since records began in the 1890s with 252 mm of precipitation[1]. Although the full impact of the wet, cool spring and flood events on agriculture would not be fully assessed for months, estimates as of the end of spring were that 8 million acres of cropland were impacted. Keystone Agriculture Producers in Manitoba estimated that 950,000 acres went unseeded prior to the flooding and a further 2.5 million acres were flooded, while Saskatchewan Crop Insurance estimated 1.4 million acres went unseeded and 3 million acres were flooded and unlikely to produce a crop.

Summer 2014 (July - August)

The summer began with post-tropical storm Arthur, which brought high winds and rain to the Atlantic region. By mid-July, dryness and heat emerged as a risk in the Pacific, Atlantic and the west-central Prairie regions. Excess moisture and thunderstorms began to delay crop development in Ontario and Saskatchewan. Overall, above-normal temperatures over much of the summer season allowed crops to mature and salvaged the 2014 crop from the less-than-ideal wet spring conditions.

The Atlantic region received rain and high winds from post-tropical storm Arthur July 4th to 6th, almost immediately following the flooding in the Prairie region. While the eastern portion of Nova Scotia and New Brunswick received between 30 to 180 mm, much of the east coast received less than 25 mm from the storms (Figure 9). The slow speed of the storm resulted in heavier damage from wind and rain. High winds ranging from 75 to 120 kilometers per hour across the entire Atlantic region had the most significant impact on agriculture, flattening crops and creating widespread power outages.

[1] Environment Canada. 2014. "Canada's Top Ten Weather stories for 2014." Available Online at http://www.ec.gc.ca/meteo-weather/default.asp?lang=En&n=C8D88613-1

Some fruit and potato crops were bruised and washed out across the Atlantic, and vineyards, fruit trees, corn and beans experienced some wind damage. Roads and highways were flooded and power outages remained widespread across much of New Brunswick until the end of July, costing producers thousands of dollars in fuel costs to run generators. The Gaspe region of Quebec was also affected by the storm, receiving between 70 to 100 mm and winds more than 100 km per hour with no reported agricultural impact. Overall, post-tropical storm Arthur had a minor localized impact on agriculture in eastern Canada, and did not significantly impact final yields or crop quality in the Atlantic region. The winds from the storm however, spread crop disease that would have more significant impacts later in the season.

Between the spring and summer, most agricultural regions had experienced a very wet growing season that significantly delayed seeding and then crop development across much of Canada. Overall, between April 1st and July 6th, more than 50 per cent of Canada's agricultural lands, including 40,000 farms and 5.9 million cattle, had received very high to record-high precipitation (Figure 10).

As July progressed, flooding continued to have a significant impact on agricultural operations in Saskatchewan and Manitoba (Figure 11). In Manitoba flood warnings continued to be in effect to the end of the month for the entire Assiniboine River Basin, Dauphin Lake and Lake Manitoba. The persistent flooding caused approximately 40 states of emergency. Warm temperatures and minimal rainfall over the rest of July advanced crop growth and allowed haying and spraying operations to advance in fields not completely flooded out. Conditions in eastern Saskatchewan also returned to near normal following the record precipitation but the impacts, including poor road conditions, reduced field access and excess moisture persisted for two to three weeks. High temperatures and precipitation through July and August across the province led to increased humidity levels that delayed haying progress and decreased hay quality.

Figure 9: Precipitation from the Impact of Post-Tropical Storm Arthur, July 1 to July 7, 2014

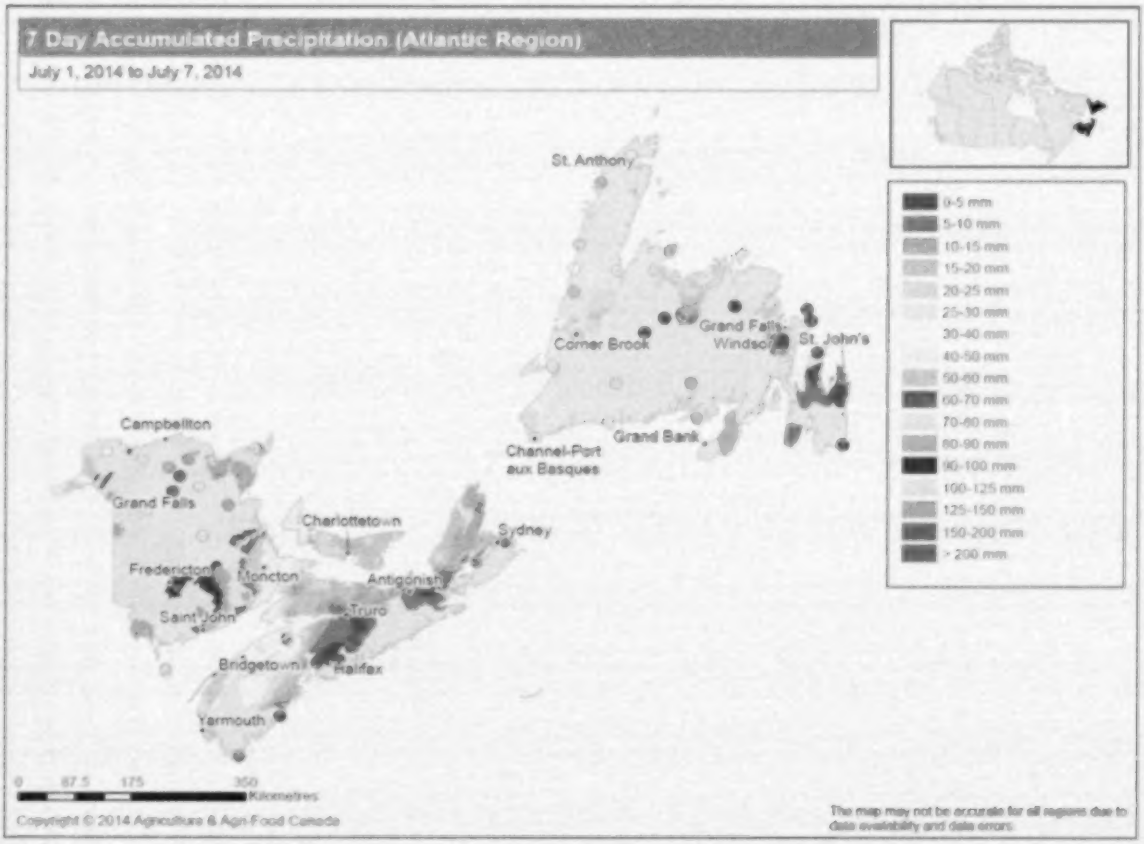
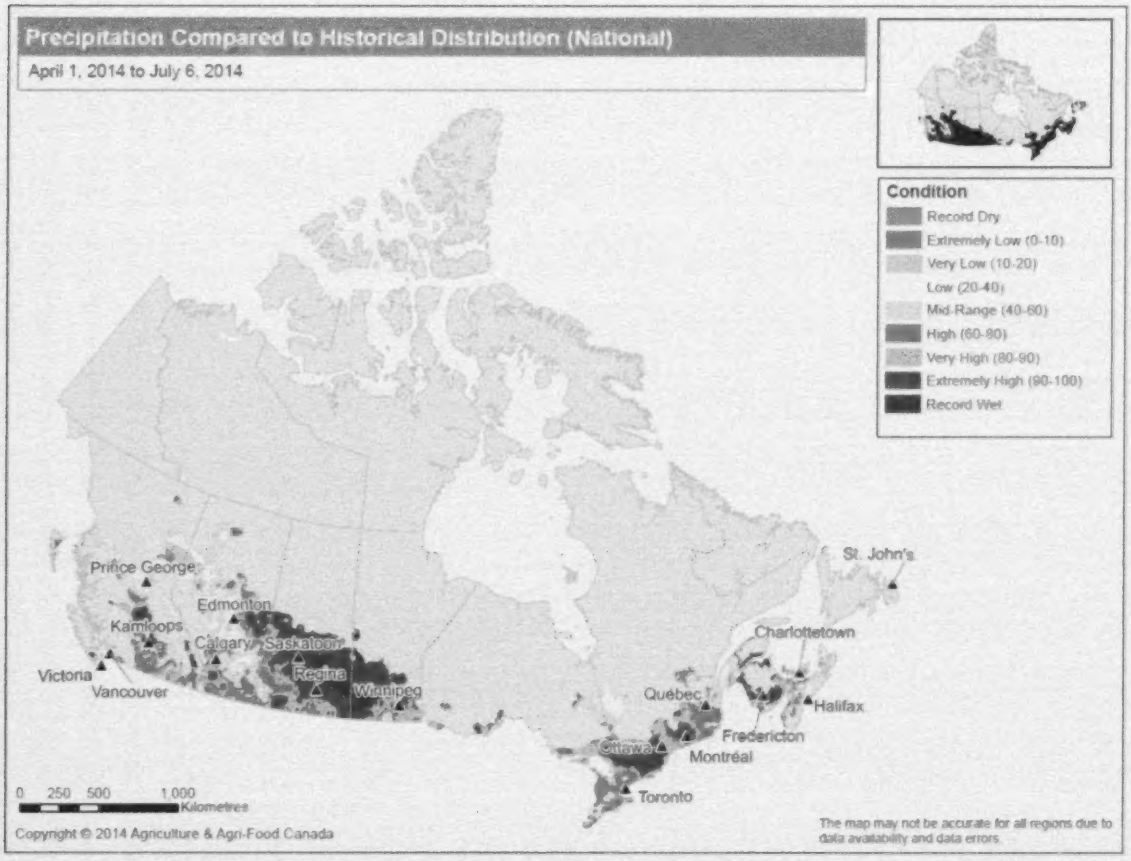
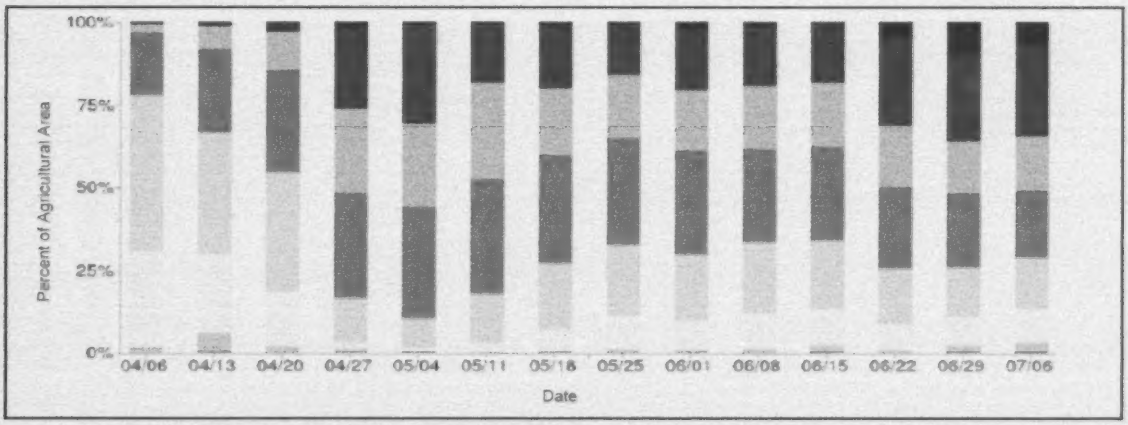


Figure 10: Precipitation Compared to Historical Distribution to July 6, 2014 and Corresponding Statistics



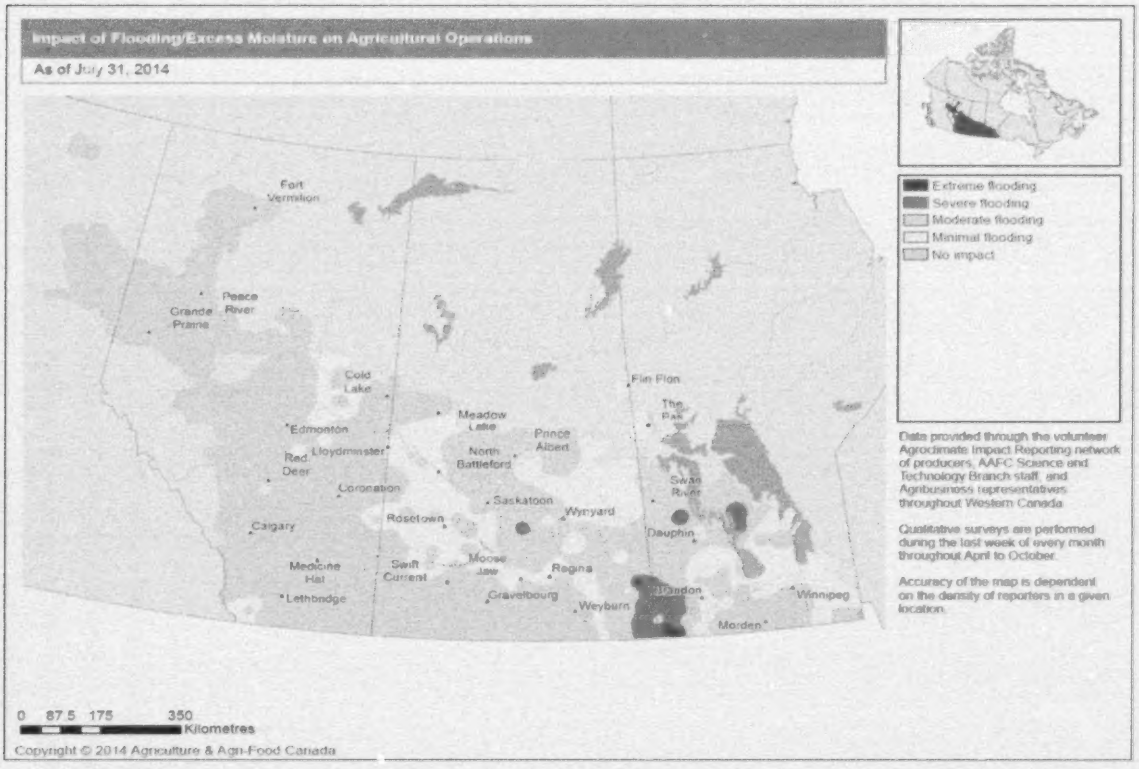


	Record Dry			Extremely Low (0-10)			Very Low (10-20)			Low (20-40)		
Date	Area (%)	Farms (000)	Cattle (000)	Area (%)	Farms (000)	Cattle (000)	Area (%)	Farms (000)	Cattle (000)	Area (%)	Farms (000)	Cattle (000)
2014-06-29	0.00	0.00	0.00	0.40	0.14	15.32	1.97	0.76	103.64	8.68	5.83	822.71
2014-07-06	**0.00**	**0.01**	**0.50**	**0.60**	**0.24**	**28.49**	**2.61**	**1.48**	**226.16**	**10.20**	**7.13**	**1091.84**

	High (60-80)			Very High (80-90)			Extremely High (90-100)			Record Wet		
Date	Area (%)	Farms (000)	Cattle (000)	Area (%)	Farms (000)	Cattle (000)	Area (%)	Farms (000)	Cattle (000)	Area (%)	Farms (000)	Cattle (000)
2014-06-29	22.56	22.60	3236.47	15.60	12.33	1989.35	25.83	19.68	2997.73	10.24	9.15	1312.60
2014-07-06	**20.39**	**23.58**	**3223.61**	**16.27**	**13.67**	**2106.99**	**27.80**	**19.84**	**2991.14**	**6.86**	**6.12**	**817.02**

These statistics were generated by comparing the Statistics Canada's 2006 Census of Agriculture dataset with AAFC's Precipitation Compared to Historical Distribution map. The climate data are provided through a partnership between Environment Canada, Natural Resources Canada, and many Provincial agencies.

Figure 11: Flooding Impact on Cropland in the Prairie Region for the Month of July

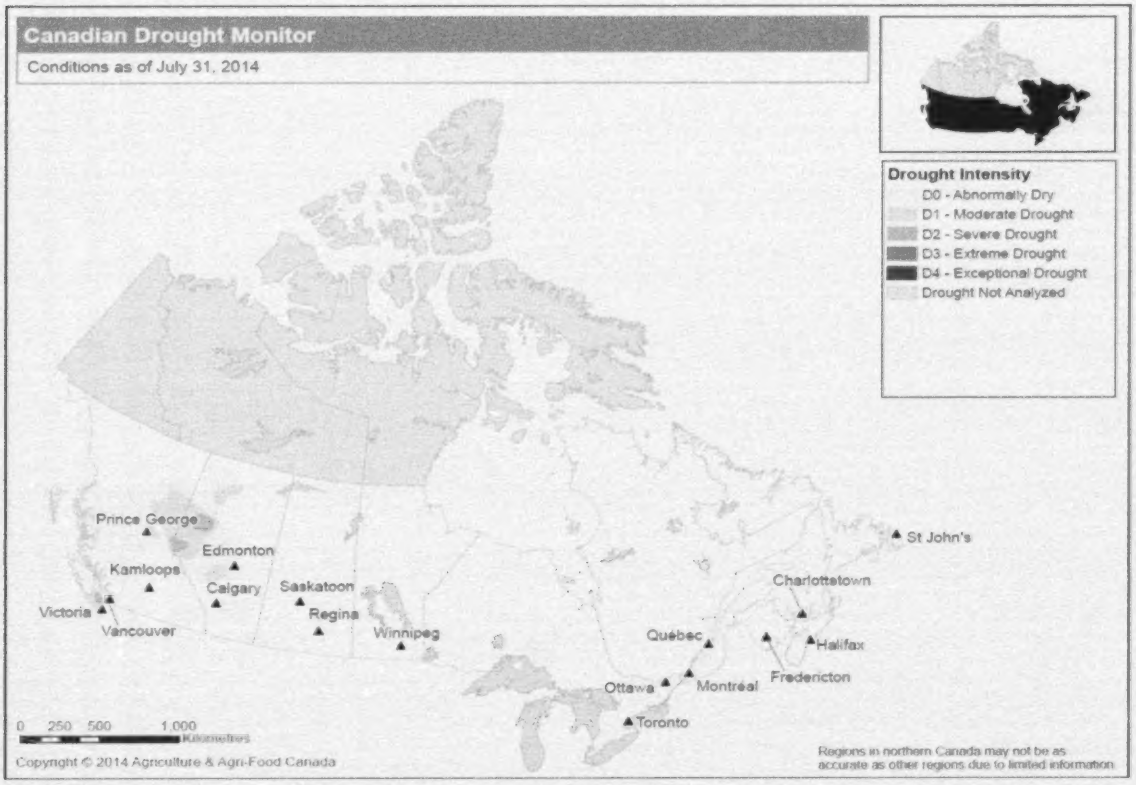


Dry regions that had previously been areas of concern in British Columbia and Alberta continued to worsen through July. In Alberta, soil moisture levels continued to decline, with the central region, northern Peace River district and a few small pockets north and north-west of Grande Prairie reported at 1 in 50 year lows. Pea, bean and blueberry crops matured weeks earlier than normal with some negative impacts on yield and quality. In mid-July, British Columbia experienced record-breaking heat across much of the province with temperatures 5 to 10 degrees Celsius above normal. Provincial drought classifications of Level 2 (dry) and Level 3 (very dry) were put in place for Vancouver Island, the Peace River district, Fraser Valley, Skeena-nass and the south and central coast. Also, crops ripened earlier than normal and producers were faced with a lack of available pickers near the end of July. As these conditions continued into August, yields were expected to be below-average by up to 20 per cent, particularly for hay and canola. Wildfire ratings were high or extreme across most of the Pacific region throughout much of the summer and upwards of 1380 wildfires (339, 000 ha) burned by September. While the number of wildfires was below the long-term average, the area burned was nearly 8 times more than the 20-year average and the province experienced the third largest loss of timber since records began more than 60 years ago[3]. Despite this, only one fire—the China Nose Fire near Houston—resulted in agricultural impacts which included livestock relocations and burned forage acreage.

The Atlantic Region also experienced dry conditions throughout July and August, however not as severe as those in British Columbia. By mid-July in Nova Scotia, cattle suffered from heat stress and corn crops began to turn brown due to above-normal temperatures. On Prince Edward Island, similar conditions had producers estimating a reduction in potato yields of 20 per cent and a delayed berry harvest. In August, farmers in Nova Scotia and Newfoundland began to purchase hay as dry conditions led to a shortage of regrowth for the third cut. These conditions were not alleviated until mid-August when precipitation amounts again reached near-normal. Overall, portions of the Atlantic region remained abnormally dry according to the Canadian Drought Monitor, while the Peace River district and Vancouver Island suffered from moderate (D1) to severe (D2) drought (Figure 12).

[3] Ibid.

Figure 12: Canadian Drought Conditions at the end of July, 2014



A series of thunderstorms across Canada, mostly in the Prairie region, caused variable damage during the last week of July and into August. In mid-July, moderate to severe hail damage occurred in south and central Alberta, and a week later 100 mm of rain over Edmonton flattened crops and caused minor flooding. The next week, a storm system with upwards of 75 mm of rain and plow winds flattened crops near Avonlea, Saskatchewan. Between August 6 and 8, a number of locations in Alberta, including Airdre, Castor, Barrhead, Lacombe, Red Deer and Drumheller received tennis-ball sized hailstones driven by high winds and heavy rain that flattened crops. Overall, 187 hail events were reported in the Prairie region over the summer with more than $250 million in total payouts for crop-related hail claims, a 45 per cent increase from 2013 according to the Canadian Crop Hail Association[3]. Ontario also experienced above-normal levels of precipitation around this time, but the overall impacts on agriculture were minor. Localized precipitation events of 100 mm occurred in southern Ontario and hail damage was reported to peach crops in Essex country July 27th. This rain coupled with low temperatures in mid-August delayed crop development, particularly for warm season crops such as corn and soybeans. By August 18, Ontario crops were largely 7 to 10 days behind.

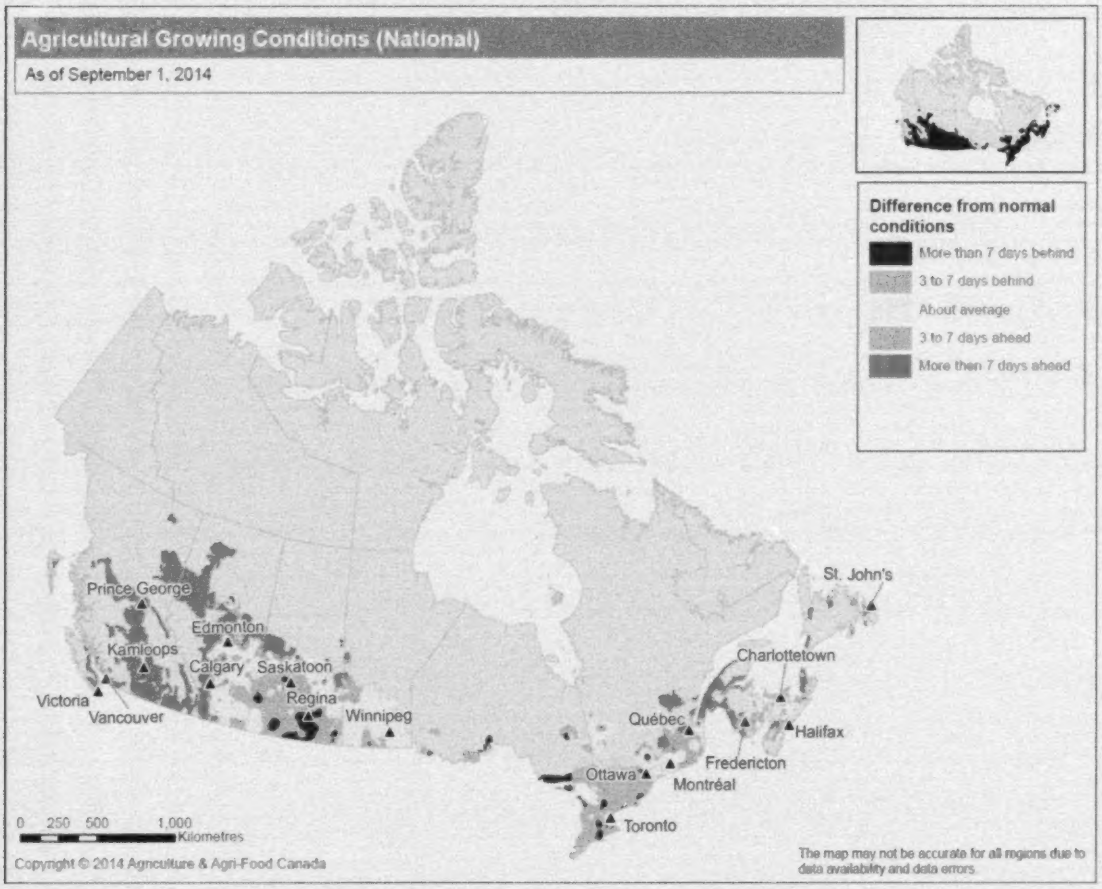
Crop diseases and insects began to emerge in early July, their progress accelerated by excess moisture in some areas and drought in others. Cutworms, wheat midge, grasshoppers, leaf spotting and root rot were reported in Saskatchewan by mid-July. Ontario grape crops were impacted by Japanese beetles while root rot and cyst nematode affected edible beans and soybeans. Wireworms became a problem for Prince Edward Island potato, barley and carrot crops in early August, and late blight for Prince Edward Island potatoes and tomatoes at the end of August. Only Fire Blight in the Atlantic region - a bacterial disease reducing fruit production spread by the wind and rain from Post-Tropical Storm Arthur - was of significant concern. The spread of the disease led to the removal of many apple orchards from Nova Scotia and some producers lost up to 25 per cent of their crop. The disease was not expected to significantly affect yields because the remaining crop had high, good quality yields.

[3] Ibid.

At the end of the summer, crop development was near normal or ahead in the coastal regions and delayed in the central regions. Although drought intensified in some areas of British Columbia by the end of August, other areas improved. While precipitation levels continued to be well below normal, periods of cool and wet conditions in the southern interior and coastal regions resulted in reduced forest fire risk ratings. Other regions of Canada were wet. The Prairie region received hail, strong winds and heavy rain at the end of August, with precipitation between 50 to 100 mm across north-west Saskatchewan and Manitoba. This gave a late-season boost to immature summer crops and pastures but disrupted harvest and led to some areas returning to flooded conditions. Some instances of light frost were reported in Alberta as well. Ontario continued to experience torrential localized rainfall, and while warmer temperatures at the end of August helped progress crop development, the late spring start meant crops were still a week to two weeks behind. The Atlantic region also received rain just before the fall, which helped producers in Prince Edward Island but resulted in disease and delayed harvest in New Brunswick. As of September 1, crop development was significantly delayed in the Prairie and Central region from a late spring start and a mixture of excess moisture, disease and humidity through the summer season (Figure 13).

Overall, the summer season for almost all agricultural regions across Canada was wet with below to near-normal temperatures. As of September 14th, approximately 53 per cent of Canada's agricultural land, representing 47,000 farm and 7.1 million cattle, had received very high to record-high precipitation. These conditions led to flooding and saturated soils, the spread of disease, degraded crop quality and delayed farming operations, ultimately significantly affecting yields, particularly in Saskatchewan and Manitoba.

Figure 13: National Growing Conditions as of September 1, 2014



For the 12 per cent of agricultural land receiving very low to record low precipitation, mainly in British Columbia, north-west Alberta and portions of the Atlantic region, crop impacts were moderate and included water supply shortages and a reduction in forage and crop yields.

Overall crop development was progressing in the Pacific and Atlantic regions but drought in the former and excess moisture and disease in the latter was slowing agricultural operations and negatively impacting crop quality. The Prairie and Central regions remained wet, and with crop development more than a week behind, the risk posed by early frost was high. These conditions set the stage for the harvest that was yet to come.

Fall 2014 (September – October)

The fall season featured snow and frost which negatively impacted agricultural production. In western Canada, much of the harvest was completed mid-October, but there were significant delays into December in eastern Canada. Untimely rains and humidity during harvest degraded crop quality in the Prairie region.

At the beginning of the fall season the most significant risks to agriculture included low temperatures, precipitation, snow and frost. In British Columbia, these conditions delayed harvest and downgraded some crop quality in the Peace region while the southern portions of the province remained hot and dry. In the Central region, a killing frost September 19th degraded crops quality. Damage in Ontario was mostly limited to crop leaves, but stalk and shank damage occurred in the most severely affected areas. In Quebec, damage was more widespread and varied by location, type and maturity of crop – generally late crops such as soybeans, grain corn and vegetable crops sustained the most damage. The Atlantic region experienced a frost in the third week of September that damaged some potato crops in New Brunswick and corn crops in all regions but the south. Some reduced yields and quality of both crops were expected .

A large storm system across the Prairie region in September significantly impacted Alberta with widespread snow and frost. The province reported temperatures below -2 degrees Celsius in the areas between Lethbridge and Calgary and snow in the western region from Lethbridge to Edmonton with localized reports of up to 45 cm north-west of Calgary. The storms snowfall was the highest September deposit before the autumn equinox in the last 130 years. In Calgary, the snow caused transportation delays and widespread power outages. Cropland between Calgary, Red Deer and High River suffered from a killing frost, lodging, smashed stalks and muddy fields with less than one quarter of harvest completed. All of this ultimately degraded crop yields and quality. Saskatchewan and Manitoba also experienced precipitation and frosts, with temperatures below -1 to -2 degrees Celsius that led some producers to swath crops early. Decreased crop yields and quality were a concern in Saskatchewan due to diseases such as fungus, fusarium head blight and root rot combined with leaching, sprouting and lodging through the fall.

The storm season carried through October and November in British Columbia. A series of intense rainstorms brought 60 to 200 mm along the coast, 100 to 250 mm in the northern interior and 75 to 125 mm to the north-east. This rain significantly improved drought conditions in the northern interior and Peace River district, but low stream flow advisories, moderate to high wildfire ratings and dry conditions remained in some areas. As of the end of the month large areas in northern British Columbia and Alberta were in moderate (D1) to severe (D2) drought (Figure 14).

Figure 14: Canadian Drought Conditions at the end of October, 2014

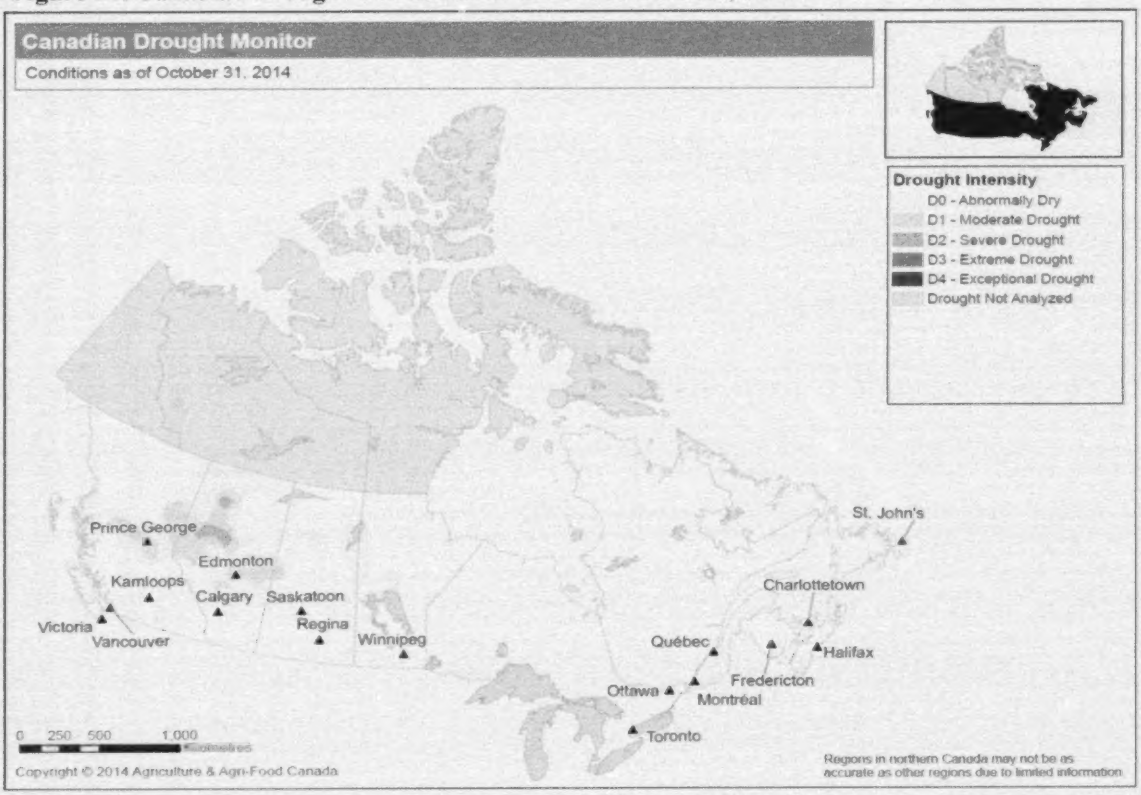
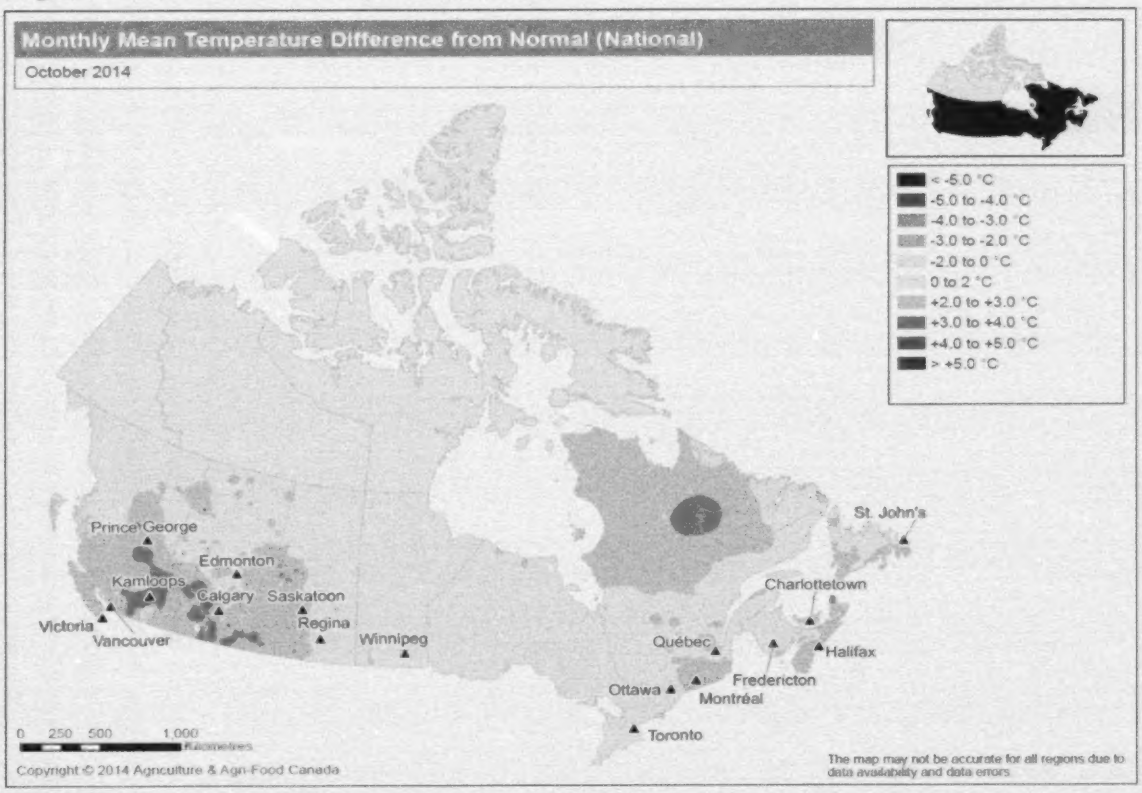


Figure 15: Above-Normal Temperatures in October 2014



Overall, reported yields during the fall were near-average with near to below-average quality in all regions except the Pacific and Atlantic. In British Columbia, hot, dry weather through the summer led to good quality crops such as apples, potatoes and other vegetable crops. Most regions of the province escaped major crop damage from dry conditions during the growing season, except for the central-interior areas near Prince George and Vanderhoof where forage yields were 40 to 50 per cent of normal. Forage shortages, increased livestock sales and crop insurance claims were reported.

Above-normal temperatures through October led to the completion of harvest by month's end in all agricultural regions except Central and Atlantic Canada (Figure 15). Harvest was delayed in Ontario, and to a lesser extent Quebec, by precipitation and continued excess moisture, which resulted in lower quality crops with a high moisture content. Similarly, precipitation and frost in the Atlantic region delayed harvest in Prince Edward Island, Nova Scotia and New Brunswick into December.

In the Prairie region, yields were near-average with below-average quality. In Alberta, crops were slightly below the 10-year average for quality mainly due to the frost and snow in early September. Saskatchewan and Manitoba crops were degraded by spring flooding, disease and storm damage, and crops were below the 10-year average for quality with near-average yields for both provinces. Provincial authorities determined that 950,000 and 1.4 million acres were left unseeded in Manitoba and Saskatchewan respectively, prior to flooding. A further 2.5 million and 3 million acres in each province were estimated to have been impacted by flooding in June. The late harvest also significantly reduced the number of winter wheat acres planted in these two provinces.

In the Central region, harvest was delayed, particularly the warm season crops. In Quebec, yields and quality were reported as near-average to slightly below-average for the crops that had been harvested by the end of October. In the north-west excess soil moisture delayed harvest by more than a week while the September 19th killing frost reduced quality all across the province. Crops in Ontario had been behind normal seasonal development since the spring particularly soybeans, corn, edible beans and grapes. At the end of October, soybeans were high in moisture content and 3 weeks behind normal for harvest while corn was 4 to 5 weeks delayed.

The Atlantic region reported good quality crops of potato, pears, plums, pumpkin and apple, despite continuing difficulties with blight and a delayed harvest. The only reported decrease in quality from weather conditions was smaller than normal corn cobs in some areas due to the dry summer and high winds from post-tropical storm Arthur.

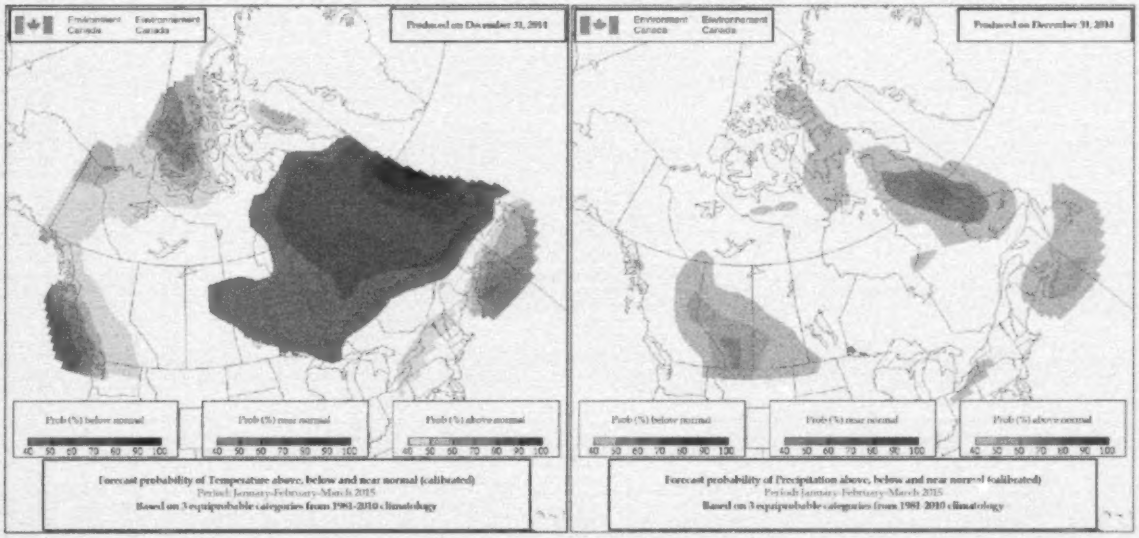
As October ended, harvest activities were wrapping up in the Pacific and Prairie the majority of crops had been harvested with near-average yields. However, in eastern Canada including Quebec, the Atlantic provinces and particularly Ontario, significant delays remained in the harvest of warm season crops, in particular soybean and corn. Many of these delays continued into December.

Winter Outlook (November 2014 to February 2015)

The primary concern heading into winter was delayed harvest in eastern Canada. November featured below-normal temperatures and heavy snow in most agricultural regions across the country. Frozen soils and excess moisture led to harvest delays in the Central and the Atlantic regions. As of December 1st in Ontario about 5 per cent of soybeans and 40 per cent of corn remained to be harvested and many producers were opting to leave corn for harvest until spring. This strategy would reduce drying costs but result in yield losses through the winter. The amount of winter wheat acres seeded were also down in this province due to the late harvest of soybeans and poor conditions during planting. This reduction increased the risk for winterkill in the coming months. Soybeans, corn and canola in north-west and eastern Quebec were also still in the field as of December 1st. In the Atlantic region excess soil moisture due to heavy rainfall and snowfall delayed harvest of soybeans and potatoes on Prince Edward Island, grain corn in Nova Scotia and soybeans in New Brunswick.

Heavy precipitation in the western and central Prairie region through November also heightened risk for producers heading into winter. Alberta and northern Saskatchewan received above-average precipitation, with much of Alberta in particular receiving more than 200 per cent of average precipitation during the month of November. Combined with the cold temperatures, some producers switched livestock to feed early, prompting concerns for potential feed shortages particularly for those regions hit hard by excess moisture in the spring. In Saskatchewan excess soil moisture combined with limited water storage availability increased the risk for significant spring flooding in the event of normal to above-normal winter precipitation. There was also an increased risk of damage to infrastructure due to high water levels.

Figure 16: Environment Canada Temperature and Precipitation 3-Month Forecasts, January 1, 2015 to March 31, 2015


Environment Canada
Environnement Canada
Produced on December 31, 2014
Prob (%) below normal
Prob (%) near normal
Prob (%) above normal
Forecast probability of Temperature above, below and near normal (calibrated)
Period: January-February-March 2015
Based on 3 equiprobable categories from 1981-2010 climatology
Environment Canada
Environnement Canada
Produced on December 31, 2014
Prob (%) below normal
Prob (%) near normal
Prob (%) above normal
Forecast probability of Precipitation above, below and near normal (calibrated)
Period: January-February-March 2015
Based on 3 equiprobable categories from 1981-2010 climatology

The Environment Canada three-month winter forecast for January, February and March suggests the 2014-2015 winter will feature average temperatures (Figure 16). There is a high probability of above-normal temperatures in the Pacific region and Atlantic regions. North-central Manitoba, northern Ontario and northern Quebec are expected to receive below-normal temperatures. The three-month precipitation forecast is for above-normal precipitation in eastern British Columbia, Alberta, south-central Saskatchewan and the Atlantic region, however the confidence level for this forecast is low.

Summary

According to Environment Canada, 2014 was the warmest year globally since 1880[4], but the coldest year on average for Canada since 1996. For most of the country, the five months between November 2013 and March 2014 were the coldest on record since 1948. What heat Canada experienced was concentrated on the coasts, with average temperatures 1.5 degrees Celsius above normal. The Pacific coast in particular experienced its third warmest summer in 67 years[1].

[4] Cole, S. and McCarthy L. "NASA, NOAA Find 2014 Warmest Year in Modern Record." NASA News Release. Available Online at http://www.nasa.gov/press/2015/january/nasa-determines-2014-warmest-year-in-modern-record/

[1] Environment Canada. 2014. "Canada's Top Ten Weather stories for 2014." Available Online at http://www.ec.gc.ca/meteo-weather/default.asp?lang=En&n=C8D88613-1

The 2014 agricultural year featured many significant weather events, including 19 confirmed tornadoes in Ontario, several tropical storms and two nor'easters in the Atlantic region and twice the number of acreage burned in British Columbia wildfires. While these events did result in some large economic impacts - $30 million in insurance claims from the tornado near Angus and a cost of more than $40 million in affected power provision on New Brunswick[3] – many of them had minimal impacts on agriculture. In general, yields were most significantly affected by the cool, wet spring resulting in unseeded acreage across Canada and large-scale flooding in the Prairie region. Provincial authorities estimate approximately 8 million acres either went unseeded or were flooded during the spring. Although warm temperatures in August allowed crops to mature, disease, humidity and precipitation during the fall and harvest significantly degraded crop quality in Ontario and the Prairie regions. Resulting crop yields cross Canada were near the long-term average with below-average quality.

More specifically, British Columbia benefitted from a hot, dry summer overall which produced high quality crops. These conditions also lead to a moderate reduction in stream flow and forage due to drought on Vancouver Island, the central interior and Peace River district. The wet, cool spring in the Prairie region reduced planted acres and slowed crop development while storms, insects and disease further reduced yields and quality through the summer. Although a hot August helped mature crops, snow, precipitation and humidity through the fall and untimely harvest rains resulted in below-average crop quality. The Central region experienced a cool and wet spring, summer and fall that delayed harvest beyond December for some crops. The Atlantic region experienced a stable growing season overall; minor storm impacts and yield reductions from the Fire Blight disease did not reduce yields below-average.

Overall, excessive moisture was a more significant risk than dryness across the 2014 growing season. By October 31st, a total of 20,548,917 acres (51 per cent) of cereal and grains and 30 per cent of Canada's beef sector were impacted by excessively wet conditions (Figure 17). Much of this area was in Saskatchewan, but Ontario also experienced excessive soil moisture particularly in the latter half of the year. British Columbia, northern Alberta and some of the Atlantic region suffered from dryness and drought during the growing season.

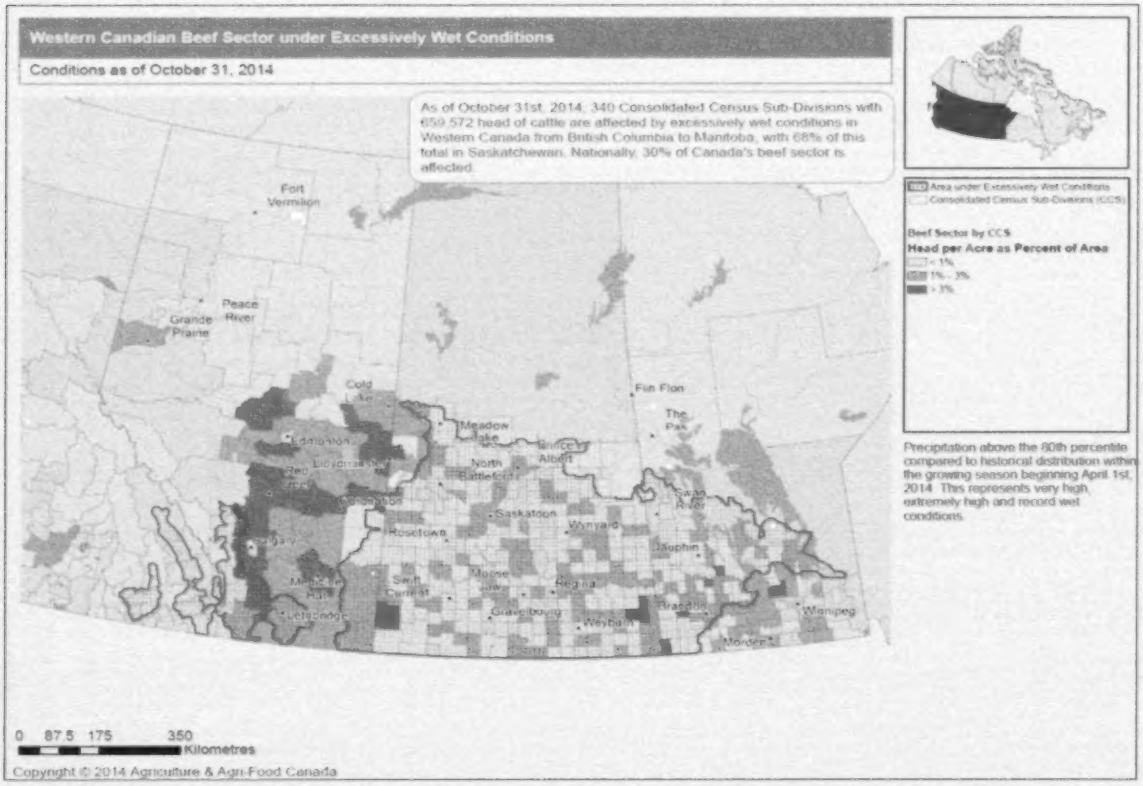
Due to the drought conditions and reduced feed supplies for livestock producers in northern British Columbia and Alberta, as well as the extreme wet conditions in south-east Saskatchewan and south-west Manitoba, AAFC announced tax deferral provisions to assist producers who had to reduce herd sizes due to lack of available feed supplies. Eligible producers in designated areas were able to defer income tax on the sale of breeding livestock for one year to help replenish breeding stock in the following year.

Although near-average, yields for almost all crops declined between 30 to 50 per cent from most crops compared to yields from the bumper crop of 2013. Only dry beans, flaxseed, mustard seed, soybean and sunflower seed had higher yields than 2013. According to Statistics Canada, the decline was in large part due to a reduction in yields and less harvested area in the Prairie region[5]. Quality for many crops was low, as disease, insects, storm damage and excessive moisture degraded crops across the country.

[3] Ibid.

[5] Statistics Canada. 2014. "Production of principal field crops, November 2014." The Daily. Available Online. http://www.statcan.gc.ca/daily-quotidien/141204/dq141204a-eng.htm

Figure 17: Western Canadian Beef and Grain under Excessively Wet Conditions, October 31, 2014


Western Canadian Beef Sector under Excessively Wet Conditions
Conditions as of October 31, 2014
As of October 31st, 2014, 340 Consolidated Census Sub-Divisions with 659,572 head of cattle are affected by excessively wet conditions in Western Canada from British Columbia to Manitoba, with 68% of this total in Saskatchewan. Nationally, 30% of Canada's beef sector is affected.
Area under Excessively Wet Conditions
Consolidated Census Sub-Divisions (CCS)
Beef Sector by CCS
Head per Acre as Percent of Area
< 1%
1% - 3%
> 3%
Precipitation above the 80th percentile compared to historical distribution within the growing season beginning April 1st, 2014. This represents very high, extremely high and record wet conditions.
Fort Vermilion
Peace River
Grande Prairie
Cold Lake
Fort Fitzgerald
Meadow Lake
Prince Albert
North Battleford
The Pas
Swan River
Saskatoon
Rosetown
Wynyard
Dauphin
Swift Current
Moose Jaw
Regina
Medicine Hat
Lethbridge
Brandon
Weyburn
Winnipeg
Morden
0 87.5 175 350
Kilometres
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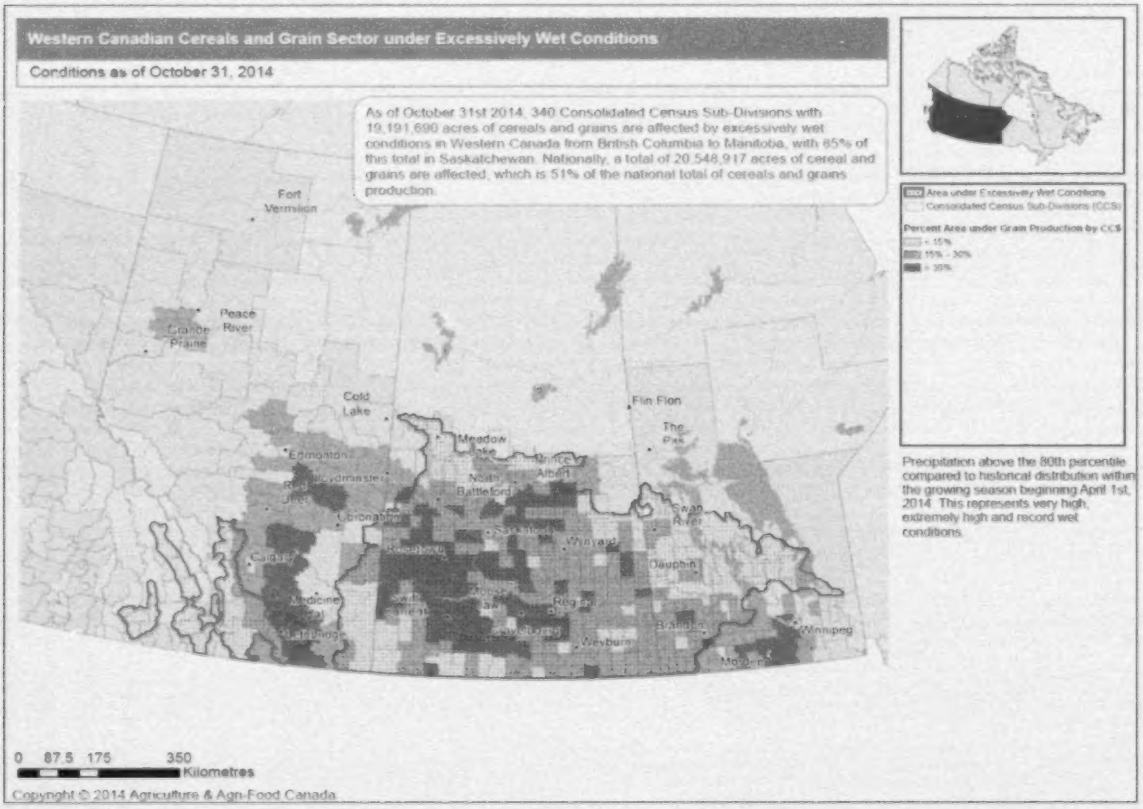
Western Canadian Cereals and Grain Sector under Excessively Wet Conditions
Conditions as of October 31, 2014
As of October 31st 2014, 340 Consolidated Census Sub-Divisions with 19,191,690 acres of cereals and grains are affected by excessively wet conditions in Western Canada from British Columbia to Manitoba, with 85% of this total in Saskatchewan. Nationally, a total of 20,548,917 acres of cereal and grains are affected, which is 51% of the national total of cereals and grains production.
Area under Excessively Wet Conditions
Consolidated Census Sub-Divisions (CCS)
Percent Area under Grain Production by CCS
< 15%
15% - 30%
> 30%
Precipitation above the 80th percentile compared to historical distribution within the growing season beginning April 1st, 2014. This represents very high, extremely high and record wet conditions.
Fort Vermilion
Peace River
Grande Prairie
Cold Lake
Fort Fitzgerald
Meadow Lake
Prince Albert
North Battleford
The Pas
Swan River
Saskatoon
Rosetown
Wynyard
Dauphin
Swift Current
Moose Jaw
Regina
Medicine Hat
Lethbridge
Brandon
Weyburn
Winnipeg
Morden
0 87.5 175 350
Kilometres
Copyright © 2014 Agriculture & Agri-Food Canada

Appendix A: Summary of 2014 Agroclimate Conditions

	BC	AB	SK	MB	ON	QC	ATL
Dec. 2, 2014	2 drought	3 snow, cold	2 excess moisture	1	3 excess moisture	2 excess moisture	2 excess moisture
Nov. 4, 2014	1 drought/dry heavy rain	1	1 excess moisture	1 excess moisture	2 cool, excess moisture	2 excess moisture	1 excess moisture
Oct. 7, 2014	2 drought	3 excess moisture	2 excess moisture, disease	3 excess moisture	1	2 frost	1 disease
Sept. 16, 2014	2 drought, low water supplies	3 drought, snow , frost	3 frost	3 excess moisture, frost	2 (frost)	1	1 disease
Sept. 3, 2014	2 drought, low water supplies	2 drought (frost)	3 excess moisture (frost)	3 excess moisture, (frost)	2 (frost)	1	2 excess soil moisture; disease
Aug. 19, 2014	2 drought, low water supplies	1 hail, heat	2 wind, humidity	2 dry	2 low temps	1	1 disease
Aug. 6, 2014	2 drought, low water supplies	1	2 excess moisture	3 flooding	2 excess moisture	1	1 dry
Jul. 22, 2014	2 low water supplies	1	3 wet	4 flooding	2 delayed growth	1	1
Jul. 8, 2014	1 (low water supplies)	1 (drought)	4 flooding	4 flooding	2 heat and lack of rain	1	2 rain, high winds
Jun.24, 2014	1 low water supplies	2 flooding	3 wet, low temps, unseeded	3 wet, unseeded	1	1	1
Jun. 10, 2014	1 (low water supplies)	1	2 wet	2 wet, delayed operations	1	1	1
May 27, 2014	1	1 low soil moisture	1	2 wet, delayed operations	1	1	1 low temps, delayed operations
May 13, 2014	1	2 low temps, delayed operations	2 low temps, delayed operations	2 low temps, delayed operations	1 delayed operations	1 delayed operations	1 delayed operations
Apr. 29, 2014	1	1 low soil moisture	1 low temps, low soil moisture	1 low temps, flooding	1 delayed operations	1 delayed operations	2 flooding, delayed operations
Apr .15, 2014	1	1 (low soil moisture)	1 low temps, (low soil moisture)	1 low temps, (delayed operations)	2 (flooding, delayed operations)	2 (flooding, delayed operations)	2 flooding, delayed operations
Apr.1, 2014	1	1 dry	2 low temps, (flooding)	1 low temps, (delayed operations)	1 low temps, (delayed operations)	1 low temps, (delayed operations)	2 flooding, (delayed operations)
Mar. 11, 2014	1	2 low temps, dry	2 low temps	2 low temps	1 low temps	1	1
Nov 5, 2013	1	2 dry	2 dry	3 drought	2 rain, wind	1	2 rain, wind

Green (1) /Yellow (2) /Orange (3) /Red (4) is a continuum of 'No significant risk' to 'Large or Urgent risk'. Text not in brackets indicates the event was currently occurring at the time of the report; text in brackets highlights a potential risk.

Appendix B: AAFC Map Products Referred to in this Report

AAFC National Agroclimate Information Service (NAIS)

Agroclimate Impact Reporting (AIR) Maps

AIR maps are based on monthly input from a volunteer network of producers, primarily in the Prairie region. Each map represents an aspect of the impacts of various weather-related risks to agriculture for any given month throughout the growing season (April to October). NAIS compiles the data and interpolates the results using geospatial techniques. The accuracy of each map varies by region based on the number of participating producers and the density of reporters across the agricultural landscape.

To view all maps produced from monthly volunteer surveys, please visit the AIR pages on AAFC's website at: www.agr.gc.ca/air

Precipitation & Temperature Maps

The suite of precipitation and temperature maps cited throughout this document are produced with data from federal and provincial climate monitoring networks, consisting of more than 2000 climate stations. NAIS applies a system of automated and manual quality control to the data to ensure suitable value for agricultural products. Map accuracy varies by the number of stations in a particular region, the instrumentation used, and the quality of the data received.

To view these maps and other related products produced by the National Agroclimate Information Service, please visit the Drought Watch pages on AAFC's website at: www.agr.gc.ca/drought

Canadian Drought Monitor (CDM) Maps

A consolidated map of drought extent and intensity for all of Canada is produced monthly. Analysis includes a review of all available data from numerous federal and provincial agencies, and interpretation by NAIS using a draft classification system. Drought intensity categories are assigned based on analysis and weighted formulas. The resulting output provides direct input into the larger North American Drought Monitor (NADM) map. The Drought Monitor summary map identifies general drought areas, labeling droughts by intensity, with D1 being the least intense and D4 being the most intense. Areas classified as D0 are drought watch areas—either drying out and possibly heading for drought, or are recovering from drought but not yet back to normal, suffering long-term impacts such as low reservoir levels.

For more information, visit the North American Drought Monitor (NADM) website:
http://www.drought.gov/nadm/

Acknowledgements

We acknowledge and thank the following groups and organizations whose reports and data were utilized to produce this 2014 Annual Review of Agroclimate Conditions Across Canada:

- AAFC's Agroclimate Impact Reporting network of volunteer producers and industry representatives that are consulted monthly to obtain agroclimate impact information
- Environment Canada, Natural Resources Canada, and the multiple provincial agencies that provide climate data for the maps that appear on Drought Watch

Seasonal forecast information was obtained from:

- Environment Canada
- International Research Institute for Climate and Society
- National Oceanographic and Atmospheric Administration (NOAA): National Weather Service, Climate Prediction Center